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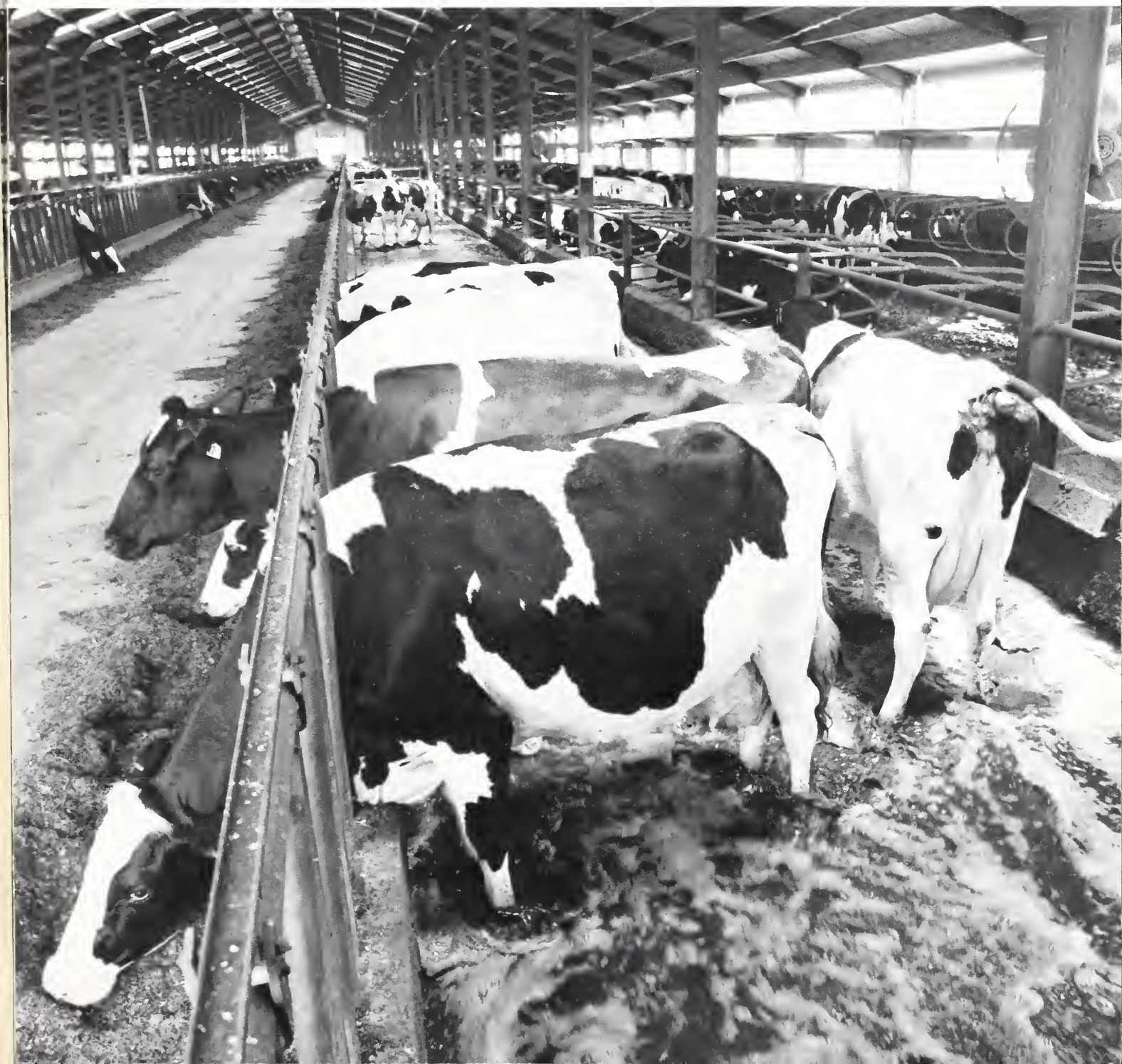

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Comments: *From the SCS Chief*

Conservation Tillage—Strategies for the Future

Secretary of Agriculture John Block told farmers and other agricultural leaders at the national "Conservation Tillage—Strategies for the Future" conference in October, "Our emphasis today is on conservation tillage research to maximize yields and minimize soil erosion."

More than 800 people gathered in Nashville, TN, to exchange their views on conservation tillage in relation to production technology, economics, ecological issues, and public policy. The exchange provides the framework for future strategies.

Conference participants came from farm and commodity groups, farm suppliers, conservation and environmental organizations, and professional and scientific groups, as well as State and Federal government.

They confirmed that conservation tillage reduces soil erosion, makes better use of soil moisture, cuts down on soil compaction by reducing field operations, reduces energy consumption, and enables farmers to use their time more efficiently.

Most importantly, as Secretary Block said—and other participants agreed—with conservation tillage there are no trade-offs that need to be made between high yields and soil conservation.

Many farmers—and more of them every year—are discovering this for themselves. In 1983, American farmers used conservation tillage on almost 1 of every 3 acres they planted . . . more than triple the percentage of just 10 years ago. We project that by the year 2010, farmers will use conservation tillage on 90 percent or more of the land they plant.

Conservation tillage is not a cure-all for all of our farm problems, and it won't work everywhere, *yet*. But, farmers are using it in more places than ever before. They are adapting conservation tillage techniques so fast that scientists are hard-pressed to stay ahead of them.

In hard economic times, farmers have tended to put conservation on the back burner until they could afford it. Conservation tillage enables them to move conservation to the front and keep it there.

Peter Myers

Cover: Manure is flushed from a Pennsylvania dairy barn. See articles on waste management beginning on page 8. (Photo by Tim McCabe, visual information specialist, Public Information, SCS, Washington, DC.)

John R. Block
Secretary of Agriculture

Peter C. Myers, Chief
Soil Conservation Service

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News Briefs

Conservation Tillage Conference Held

A major national conference on conservation tillage held October 3–5, 1984, in Nashville, TN, sparked intensive discussion on one of the fastest-growing practices in the history of farming.

More than 800 people attended the 3-day conference, "Conservation Tillage—Strategies for the Future"—about half from agribusiness and the rest from government, universities, farms, and news media. Most participants represented the U.S. Department of Agriculture or one of the 62 national organizations that co-sponsored the conference.

In remarks at the opening luncheon for the conference, Secretary of Agriculture John R. Block said, "We have convened this conference because fighting soil erosion is USDA's current number one priority in our conservation programs. And conservation tillage is our number one weapon in that war."

Block said that farmers are adopting conservation tillage at an unprecedented rate. He added, "There are no trade-offs that need to be made between high yields and soil conservation."

Following the luncheon, conference participants heard business people, farmers, and researchers discuss the effects of conservation tillage on agriculture. The speakers agreed that farmers will continue to demand improvements in conservation tillage technology—and be innovative themselves—as they continue to expand their use of the practice.

The second day was given over to four issues related to conservation tillage: production technology, ecological issues, economics, and public policy. In meetings that Soil Conservation Service Chief Peter Myers termed "the heart of the conference," participants formed small groups to discuss presentations made by panels of experts. Participants analyzed the issues and developed tough questions for the panelists. The interchange between panelists and participants stimulated recommendations for further study. Panel moderators later summarized group discussions at the closing session of the conference.

At luncheon on the second day, keynote speaker Orion Samuelson of radio station WGN in Chicago, IL, urged participants to create a climate of mutual understanding between urban and rural people.

During the conference, the following points surfaced again and again:

- Conservation tillage can save fuel, time, and operating costs as it reduces erosion, and therefore is continuing to become more attractive to farmers;
- Conservation tillage must be adapted to the site. And research is making possible the use of conservation tillage in more areas every year;
- Cooperation among disciplines, agencies, and organizations is essential for the successful promotion and adoption of conservation tillage;
- Conservation tillage requires farmers to be better managers;
- Research and development on conservation tillage must continue;
- Conservation tillage alone may not be enough to maintain resource conditions. To be most effective as a conservation practice, conservation tillage should be part of an overall system of resource management.

Conference organizer Richard D. Siegel, Deputy Assistant Secretary of Agriculture for Natural Resources and Environment, said, "This was the first time that such a large and diverse group of experts have gathered to discuss the conservation tillage phenomenon, where it's heading, and how agriculture and the public can derive the most benefit from it. We had high expectations when Secretary Block announced the conference as one of his major initiatives for 1984 and when we planned it in conjunction with all the participating organizations. The meeting exceeded our expectations!"

Two other events were held in conjunction with the conference. The Farm and Industrial Equipment Institute's Tillage and Crop Production Council held its 1984 conference in Nashville on October 2–3. The session included meetings of standing committees and a technical program on bio-technological developments affecting crops, no-till research, and marketing strategies for conservation tillage equipment.

A second related event was Secretary Block's presentation of award certificates to conservation farmers at ceremonies in Guthrie, KY, during the morning of October 3. The awards were presented to the 10 national finalists in the second annual conservation farmer of the year program sponsored by the National Endowment for Soil and Water Conservation and the Du Pont Company.

Jim Benson,
public affairs specialist, SCS, Washington, DC

Space Shuttle Measures Soil Moisture

Orbiting satellites may one day measure soil moisture. The October mission of the space shuttle Challenger included an experiment to determine whether radar can be used to measure soil moisture to a depth of 6 inches.

The experiment was conducted by USDA's Agricultural Research Service (ARS) and the National Aeronautics and Space Administration (NASA). It was based on the fact that soil moisture reduces the intensity of the echo when microwaves are reflected from the earth's surface.

"As far as we know, there were no problems with the experiment," said Albert Rango, chief of the ARS Hydrology Laboratory in Beltsville, MD. "We won't know for sure until we receive all the data, in 6 to 9 months."

Although it may take a decade or longer, ARS hydrologists hope to eventually be able to produce daily soil moisture maps. Farmers could use this information to precisely regulate the application of

irrigation water for maximum crop benefits and minimum waste of resources. Soil moisture information is also valuable in timing field operations and predicting crop yields.

In the experiment, data were collected from the radar aboard Challenger as it passed 140 miles above farms near Fresno, CA. These data will be compared to data collected simultaneously from radar aboard low-flying aircraft and soil samples gathered by ground crews.

ARS and NASA scientists first began tracking differing radiation emitted from wet and dry soil in 1979 with a truck-mounted microwave antenna. They later used airplanes and discovered that soil moisture can be detected by radar even if the land is covered with plants. In 1981, radar on the space shuttle Columbia detected ancient riverbeds beneath several feet of sand in southern Egypt.

The average penetration of the radar in the experiment was 6 inches or less into the soil. "It's the layer that changes most rapidly," Rango said. "Once we know enough about the top layer of soil, we can construct models that will tell us about the lower layers."

Soil moisture data could eventually make U.S. and world crop production estimates more accurate. "We can measure crop acreage now," said Edwin Engman, hydrologist at the Beltsville laboratory, "but we cannot accurately predict how well that crop will grow."

1985 National Wildlife Week

With spring comes the renewal of life—crops are planted, flowers bloom, and animals are born. It is a season of awakening and growth. What better time for a celebration of one of our Nation's most important natural resources—the soil.

The National Wildlife Federation and its State affiliates have chosen soil as the focus of National Wildlife Week 1985. "SOIL—we can't grow without it" is the theme for the popular annual observance, taking place the first week in spring, March 17 to 23. Millions will participate in Wildlife Week, bringing a new awareness of our soil resources to classrooms, nature centers, and homes in every State, the Virgin Islands, and Puerto Rico.

Eddie Albert and Rowlf the Dog will co-chair National Wildlife Week 1985. Eddie Albert, known for his leading role on the television series "Green Acres" and a long-time friend of conservation, and Rowlf the Dog, the piano-playing member of the Muppet Family, will appear in a national television and radio public service campaign to promote the conservation of valuable soil resources. Together they will stress our dependence on soil and the importance of conserving soil for people and wildlife.

To help America celebrate Wildlife Week, the National Wildlife Federation will distribute more than half a million Wildlife Week Kits free of charge to educators across the country. Among the materials included in the kit are two colorful posters, an educator's activity guide, 36 mini-poster stamps, and an overhead transparency.

The Soil Conservation Service has played a major role in Wildlife Week 1985. The theme poster, the showpiece for Wildlife Week, was photographed by Tim McCabe, SCS visual information specialist. It illustrates stripcropping on the rolling hills of a well-planned Pennsylvania farm. The newest component of the kit, a full-color overhead transparency, was provided by SCS and shows a close-up cross section of a soil ecosystem.

SCS is assisting in the distribution of Wildlife Week Kits through its State and local offices and the National Wildlife Federation State affiliates.

Betty Olivolo,
Wildlife Week Coordinator, National Wildlife Federation, Vienna, VA

A Pennsylvania farm provides the backdrop for the 1985 National Wildlife Week poster.

Photo, Tim McCabe, visual information specialist, SCS, Washington, DC.

Conservation Measures Stand Up Against Kansas Storms

One of the wettest Junes on record in northeastern Kansas caused about $40 million worth of damage to crops and farmland, reports John Reh, Soil Conservation Service assistant State conservationist for water resources in Salina.

From June 7 to 9, 10 or more inches of rain fell in much of Brown, Doniphan, Atchison, Jackson, and Nemaha Counties. On the flood plains of watersheds in the area, agricultural damage totaled about $13 million, mostly in crop losses.

In the upland areas of the watersheds, 734,000 acres lost an estimated 48 million tons of soil. Damage to crops and farmland totaled $19 million. SCS estimates the damage to conservation structures such as terraces and waterways in the affected watersheds at $8 million.

SCS district conservationists in the area reported that although storm damage was heavy, where fields were terraced and protected by heavy crop residue, or in wheat or hay, little soil erosion occurred.

Conservation structures in Brown County took an especially hard beating, reported SCS District Conservationist Steve Henningsen. Some terraces overtopped or completely filled with sediment, especially where crops had just been planted on freshly tilled ground.

Emergency spillways in the Little Delaware–Mission Creeks watershed overflowed, damaging roads below them. Fast-moving water scoured soil on the flood plain of the Wolf River watershed, and the community of Robinson suffered heavy flooding.

Henningsen also reported that one Brown County farmer who had planted soybeans in heavy wheat stubble on a 5-percent slope came through 13 inches of rain in 3 days with negligible soil erosion. The farmer's cropland is terraced and crops are planted on the contour.

Another Brown County farmer planted corn into red clover that he had previously killed with a herbicide. His no-till cropping system provided excellent protection from soil erosion, said Henningsen.

On the steep, erodible cropland of Doniphan County, erosion was severe on bare soil, but much less occurred in areas with a good cover crop or blanket of crop residue, said SCS District Conservationist John Meisenheimer in Troy.

On a farm southwest of Troy, 6 inches of rain fell in 4 hours one evening followed by another 3 inches 36 hours later, he said. But no-till corn planted in heavy wheat stubble on an unterraced field of 18 percent slope suffered only minimal erosion.

Many other unterraced fields of corn planted with conventional tillage on slopes of 5 to 8 percent lost most of several inches of newly tilled soil. "It looked like a bulldozer blade had sliced away the soil," said Meisenheimer.

After 7 inches of rain had fallen in 4 hours on June 7, well-established grass on grassback terraces in Doniphan and Atchison Counties prevented erosion damage, even though water overtopped the terraces. This type of terrace reduces the slope between terraces, resulting in very little sediment in the terrace channels.

Northern Atchison County was deluged with 9 to 13 inches of rain on June 7 and 8, and the Independence Creek watershed received 11 to 15 inches. This followed heavy tornado damage that had occurred over the county on May 26.

SCS District Conservationist Lowell Moser in Effingham reported that upland fields in wheat, oats, and clover suffered the least damage to terraces or crops. But where crops had just been planted using conventional tillage, terraces were filled with silt and tile-outlet terraces overtopped. Erosion was less, he said, where crop residue was still on the soil surface.

On upland fields around Good Intent, northwest of Atchison, many terraces overtopped and carried a swath of soil 2 to 4 inches deep and 25 to 30 feet wide down to the next terrace. In that area, where corn or grain sorghum were planted in 1,500 pounds or more per acre of residue of the previous crop, very little soil erosion occurred.

On steep, terraced land north of Atchison, where the soil was bare after just having been planted to a row crop, soil erosion was very heavy, Moser noted. Damage was worse the farther downhill the water went.

Said Moser, "Some Atchison County farmers are realizing that the emphasis on clean-tilled soybeans as a good cash crop is creating a monstrous soil erosion problem in the hilly fields of the county." Moser sees a need to move toward more wheat, no-till soybeans in wheat residue, and clover crops.

Northern Jackson County received up to 12 inches of rain June 7 and 9. The county received another 5 inches a week

SCS Resource Conservationist Lonnie Schulze stands in a 3-foot-deep gully formed by 10 inches of rain that hit Doniphan County, KS, in 3 days last June. The sloping cornfield had no conservation treatment.

Photo, Jerry Lee, conservation agronomist, SCS, Salina, KS.

later. Several new high-water marks were set in the Muddy Creek, Delaware River, Upper Elk Creek, Straight Creek, and Spring Creek watershed flood plains.

The flood plains suffered widespread scouring and sedimentation according to SCS District Conservationist Dennis Brinkman in Holton. Terraced cropland, he said, had less erosion damage than unterraced fields. But many terraces silted full and overtopped, and a few terraces washed out.

One Jackson County farmer near Whiting had very little soil erosion on a field of 3-percent slope on which he had planted no-till grain sorghum into heavy wheat stubble. A neighbor's clean-tilled field, with a similar slope, suffered severe erosion.

Southern Nemaha County received 9 to 11 inches of rain between June 6 and 9, causing severe soil erosion on unprotected cropland with slopes of 5 to 9 percent. Roads and bridges adjacent to the fields were also heavily damaged.

The disk has generally replaced the plow in Nemaha County; but on terraced fields where most of the crop residues had been disked under, the terrace channels filled with silt. Some of these terraces overtopped.

However, there was a clear difference between these severely damaged fields and fields on similar slopes where grain sorghum had been planted with a no-till drill into the residue of the previous grain sorghum or wheat crop. Such fields, with about 3,000 pounds of stubble per acre left on the soil surface, are also terraced—and had very little erosion.

SCS State Conservationist in Kansas, John W. Tippie, said that these June 1984 storms have proven that resource management systems need to be designed for each individual tract of land. In some instances, no-till cropping systems alone controlled soil erosion while other tracts of land required a combination of terraces, contouring, and high levels of residues to achieve adequate protection.

Fred L. Trump,
public affairs specialist, SCS, Salina, KS

Alabama Farm Gets a Facelift That Inspires Others

It was 7 a.m. on Saturday, November 19, 1983. Blue smoke rose from more than a dozen earthmoving machines as they began to push through the soil with their blades. A helicopter hovered overhead, and a team of school buses began to move slowly along their assigned course.

By the end of the day, more than 3,500 farmers and others involved in agriculture had watched parallel terraces with underground tile outlets being installed, a gabion grade control structure being built, forest management being demonstrated, no-till planting equipment being demonstrated, and much more. News reporters had a bird's eye view of the work from the helicopter and the school buses took people to the different work sites.

The occasion was Operation Soil Facelift, a massive soil conservation demonstration held on the 420-acre Allen Bragg farm near Huntsville, AL. The demonstration was part of a larger effort, Operation SOIL (Save Our Important Land), begun in January 1983 and coordinated by the Alabama Rural Development Council.

The council, in cooperation with Federal, State, and local agencies, is sponsoring Operation SOIL in 16 north Alabama counties to make landowners more aware of the area's excessive soil losses and how they affect farmland productivity. The 16-county area produces $797 million worth of agricultural products, 42 percent of Alabama's total annual farm sales. The objectives of the Operation SOIL effort are to: control soil erosion in order to maintain or increase productivity and farm income; improve water quality in the areas' streams, lakes, and rivers; increase public awareness of soil erosion and water quality problems; and evaluate the impact of soil erosion and water quality control measures on farm income.

The cropland in the area has an average sheet and rill erosion rate of 10 tons per acre per year. That is more than twice the national average and more than double the tolerance level that soils in the area can sustain without losing productivity.

"The Bragg farm was chosen for the conservation demonstration because its soil erosion problems were representative of many of the farms in the Operation SOIL area," said James Long, chairman of the demonstration committee and a member of the Madison County Rural Development Committee.

The average annual soil loss on the farm was 24 tons per acre, which, according to Soil Conservation Service studies, would reduce crop yields by 20 percent every 10 years if allowed to continue. The conservation system that SCS designed for Bragg's farm will reduce average annual soil losses to an estimated 3 tons per acre.

Said Bragg, "Farmers are in a tough spot. They can't afford to apply all the conservation practices that they need in the long run."

Although erosion rates on Bragg's farm were high, it wasn't because he had been ignoring the problem. He had made some use of conservation tillage. There was an old system of terraces in place, but because they couldn't be followed with Bragg's modern machinery, gully erosion was a severe problem.

What was needed was a complete conservation system of residue management to control sheet and rill erosion and structural measures to handle excess runoff and prevent gully erosion. The structural measures were installed on Bragg's farm through Operation SOIL Facelift. Conservation tillage, crop rotations, and crop residue management, including elimination of fall tillage, will provide a strong deterrent to sheet and rill erosion.

Thirty private contractors donated about $40,000 worth of construction assistance to the farm demonstration. This was coordinated by the Land Improvement Contractors of America, Alabama chapter. They built 9½ miles of cropland terraces, installed 6,000 feet of underground tile outlets, stabilized a streambank, built a 2,500-foot dike to protect bottomland from flooding, and planted 7 acres of severely eroding mar-

ginal cropland to permanent grass. They had done much of the preliminary work for installing the practices several weeks before the day of the demonstration.

Cooperating agricultural groups contributed about $45,000 in cash or in-kind services for the conservation demonstration. Under a 5-year, long-term agreement with Bragg, the U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service (ASCS) is providing 60 percent cost-share assistance to cover the costs of vegetating waterways, field borders, and other critical areas.

Agencies and organizations cooperating in the farm facelift program included the Madison County Rural Development Committee; the Alabama Soil and Water Conservation Committee; the Alabama Association of Conservation Districts; the Madison County Soil and Water Conservation District; the Alabama Cooperative Extension Service; Alabama Agricultural Experiment Station at Auburn University; the Alabama Forestry Commission; the Tennessee Valley Authority; the Alabama Farm Bureau; and the U.S. Department of Agriculture's SCS, ASCS, Farmers Home Administration, Forest Service, and Statistical Reporting Service. Many of these agencies are also cooperating in Operation SOIL.

"The underlying strength of Operation SOIL comes from the tremendous interagency cooperation that is going into it," said Ernest V. Todd, SCS State conservationist in Auburn. "The agencies are working in concert with local groups and land users." SCS has designated the 16 north Alabama counties as a targeted area to receive additional funds and personnel to help landowners apply needed conservation measures.

The Operation SOIL effort is paying off in increased awareness of soil erosion problems and actions taken to solve them. Since Operation SOIL Facelift was held last year, more than 3,000 people have attended 100 smaller conservation demonstrations held throughout the 16-county area.

Eleven farms in six counties have been selected as Resource Management Conservation farms, or high-erosion areas. These farms will receive accelerated financial and technical assistance from cooperating agencies and be used as demonstration farms. It is planned to have a total of 25 such farms in 1985 and 35 in 1986. The Cooperative Extension Service is coordinating this effort.

SCS Conservation Agronomist Kenneth Rogers in Auburn said, "In 1983, farmers in the Operation SOIL area planted 832,000 acres in row crops, and they used some form of conservation tillage on 30 percent of them." Based on increasing requests from farmers for assistance from SCS field offices, Rogers expects 1984 figures to show an increase in farmers' use of conservation tillage.

Operation SOIL Facelift removed the scars caused by long years of growing cotton and soybeans on the Bragg farm by applying a complete conservation system that will keep the farm productive for future generations. The project has sparked others to do the same for more north Alabama farms.

Morris S. Gillespie,
public affairs specialist, SCS, Auburn, AL

No-Till Conference Keeps Alabama Farmers Informed

The Wiregrass Substation of the Alabama Agricultural Experiment Station hosted the Southeast No-Till Conference this past July. It was the first conservation tillage field day held in the State. More than 3,000 farmers and others involved in agriculture throughout the Southeast attended.

"Our goal was to share all the information we have about no-till farming with growers in 1 day," said Joe Touchton, conference chairman and agronomist with the Alabama Agricultural Experiment Station at Auburn University.

Alabama researchers stationed at 17 tour stops discussed their findings on plant nutrition; weed, insect, and disease control; and tillage practices for cotton, soybeans, grain sorghum, peanuts, and corn. Researchers from other States displayed their research findings on posters. Agribusinesses demonstrated their conservation tillage equipment.

Conference participants visited two nearby farms to see no-till crops being grown. One of the no-till farmers, Rabon Holland, told the tour group about the 40 to 50 bushels of wheat he harvests followed by peanuts or soybeans. Holland said that last year his no-till soybeans out-produced those grown in the area by conventional farming methods.

In addition to the Alabama Agricultural Experiment Station, sponsors of the conference included the Alabama Cooperative Extension Service, Alabama Association of Soil and Water Conservation Districts, Alabama Farm Bureau, Tennessee Valley Authority, and the U.S. Department of Agriculture's Soil Conservation Service and Agricultural Stabilization and Conservation Service.

SCS State Conservationist Ernest V. Todd said, "Farmers have increased their use of no-till and other types of conservation tillage in Alabama from 16,000 acres in 1973 to 614,000 acres in 1983. We expect farmers to increase that number of acres over the next few years.

"This no-till conference was a good way to give farmers the research information they need in making important cropland management decisions."

Morris S. Gillespie,
public affairs specialist, SCS, Auburn, AL

Waste Management

A Measure to Save Lake Parker

People concerned about polluted waterways can make a difference, as residents of the northeastern Vermont town of Glover can attest. Through quick action and perseverance, the shoreline dwellers of Lake Parker banded together to revive their dying lake.

Affectionately termed Parker Pond, the 206-acre lake is the focal point of forested hillside vistas. One hundred twenty-five properties line the shore and 11 dairy farms lie within its 5,240-acre watershed.

Summertime activities flourished in and around the lake and the area was particularly well known for its rainbow trout fishing. But gradually the water became choked with weeds and slimy with algae, inhibiting swimming and boating. Trout yields declined and were replaced by stunted yellow perch, rock bass, and numerous bait fish. An obnoxious odor emanated from the water, further reducing the lake's recreational value. Lake Parker was polluted.

Residents and summer camp owners were alarmed. They were dismayed by the unsightly and smelly weed growth and knew that if this decline in water quality was not reversed, their property value would also decline. So would the economy of local businesses, which provide goods and services to those who enjoyed the lake.

Through the Lake Parker Association, landowners began to seek help to solve the pollution problem. Working with the Vermont Department of Water Resources, they took samples, made tests, and compiled data. They found a high concentration of phosphorus in the water, and samples showed high counts of fecal coliform bacteria in parts of the lake. A voluntary program of dye-testing individual septic systems around the lake was initiated by the Lake Parker Association, supported by the State. Results proved negative.

The dairy farms in the watershed were now suspect. The Association petitioned the town to alter a road ditch and install a new culvert to divert the runoff from one of the farms away from the lake.

One farmer, whose manure pile flowed into the lake, was reprimanded by the State Water Resources Department. The Department took another farmer to court for violating the State's water quality laws when the manure from his winter storage area flowed into a stream that entered the nearby lake.

The State and the Association turned to the Soil Conservation Service, through the Orleans County Natural Resources Conservation District (NRCD), for help.

A study done by the NRCD and partly financed with a grant from the Vermont Agency of Environmental Conservation showed that the farms in the watershed supported 666 animal units which generated 12,000 tons of manure a year. From this manure approximately 4.8 tons of phosphorus contributed to a 5.5-ton annual phosphorus load to the lake. Of the 11 dairy farms in the watershed, one had only small acreage in the watershed, one had less than a dozen cattle, and the runoff from one had already been diverted from the watershed. That left eight farms as the primary pollutant source.

Working with these farmers, SCS found that agricultural waste management problems resulted from: (1) a significant increase in the number of cattle (thus, higher concentration) on each of the farms; (2) the proximity of the cows to the nearest perennial stream (less than 200 feet on seven of the farms); (3) the lack of facilities to store manure through the winter; (4) the steepness of slope from farm to stream causing fast runoff from barnyard and feedlot; (5) the lack of adequate systems to treat the milking center waste water before it enters the nearby water courses; and (6) the runoff from roofs and adjacent fields flowing through barnyard or feedlot and manure storage areas on its way to stream and lake.

Although they were not convinced they were at fault, the farmers were willing to discuss the benefits that would result from improved management practices. With commercial fertilizer prices rising annually, any manure nutrients saved through proper storage and application would not only be beneficial to the land but would also put money into the farmers' pocketbooks. It would also save wear and tear on machinery. Deep snow and

The beauty of Lake Parker in northeastern Vermont was marred by weeds, algae, and an obnoxious odor. Testing showed a high concentration of phosphorus and high counts of fecal coliform bacteria in the lake.

subzero temperatures are hard on equipment and uncomfortable to the operator. Also, cleaner and drier barnyards and feedlots would result in better working conditions and improved herd health and production.

But the farmers were hard pressed to come up with money for these improvements. Milk prices remained constant while annual inflation rates drastically increased the cost for other needed improvements, operating costs, and stock replacements. Borrowing for other than production needs had to be carefully analyzed. Any plan to address the needs of the watershed had to address the problem of financing.

After consulting with the Lake Parker Association, the Agency of Environmental Conservation, and Federal agencies, the town of Glover and the NRCD submitted a request for assistance to the Northern Vermont Resource Conservation and Development (RC&D) Council.

In December 1980 the RC&D Council, assisted by SCS, developed a measure plan which documented the problem, evaluated its effects, and considered alternatives. It proposed a solution, identified expected benefits, estimated costs, and set cost-share limits. The town of Glover and the Orleans County NRCD sponsored the measure.

SCS contacted each farmer and developed individual farm plans. These plans addressed the need for manure and milking center waste water management, barnyard and feedlot runoff control, and soil erosion control. All the farmers agreed that their plans would become part of the overall plan and that they would implement and adhere to the plans if cost sharing for the project was approved.

The measure plan was approved and signed by representatives of the town of Glover, the NRCD, and SCS. At this time a project agreement was signed between SCS and the town of Glover. Individual contracts between the town and each of the farmers were also signed. All cost share funds were to be allocated to individual cooperators within 18 months. As each farmer would complete a portion of the plan, he would be reimbursed by the town of Glover, which in turn would be reimbursed by SCS.

Manure storage structures were major components in seven of the eight contracts. One farmer already had one. The cost-share rate was set at 75 percent but not to exceed $15,000. Although a number of high-quality commercial structures were available, none were selected because of their cost. All seven farmers chose to build structures designed by SCS.

Site surveys were made and structures designed to contain 6 months' manure production on each farm. Each design was for the least costly structure that would meet the intent and requirements of the plan, fit the desired site and its topography, accommodate the landowner's existing equipment, and meet his desired handling method. All seven farmers elected to use their existing manure handling equipment and to continue handling the manure as a semisolid.

In addition to designing manure storage structures, SCS helped the farmers with milking center waste water disposal systems and diversions to direct runoff around barnyards and feedlots.

Site selection and design planning were done by SCS in cooperation with the farmers. SCS made the engineering surveys, designed the structures, and provided the farmer or his contractor with plans, specifications, and construction layout. SCS made sure that construction was done according to design and that it met standards and specifications.

On July 1, 1982, the last cost-share item in the farm contracts was certified. Six weeks remained to process the final accounts and complete payment to the cooperators before the 18-month deadline. Total construction costs of the Lake Parker RC&D measure were $162,000. Of this farmers paid $58,000.

SCS will monitor agronomic practices, such as land application of manure, for 5 years from the start of the contracts. But landowners around the lake already had noticed a marked improvement in water quality by the end of the summer of 1982.

SCS and the Orleans County Natural Resources Conservation District worked with other agencies and area dairy farmers to develop farm plans. The plans included barnyard and feedlot runoff control, soil erosion control, milking center waste water management, and manure storage structures, such as this timber structure on the David Young farm.

Herbert H. Dunbar, Jr.,
soil conservation technician, SCS, Newport, VT

The Economics of Waste Management

Four years ago, Don Perkins, a dairy farmer in Penobscot County, ME, resigned from spreading manure daily and built a post and plank manure storage structure. As a member of the Agricultural Stabilization and Conservation County Committee at the time, he felt a responsibility to set a good example for other farmers and reduce pollution caused by winter-spread manure. He took this into consideration when he decided to build a 6-month storage structure for his 100-cow herd. The structure is 50 feet wide, 96 feet long, and 10 feet high with a capacity to hold 48,000 cubic feet, or 307,200 gallons, of liquid manure.

Two years after using the storage structure, Perkins and the Soil Conservation Service got together and analyzed the cost effectiveness of his new manure management system. To do this, Perkins and SCS determined the change in costs from the old to the new system. They then compared cost differences with any additional benefits derived from manure being stored and spread when desired.

Perkins' analysis showed that about 601 hours were spent annually in handling manure before the storage was built and 325 hours after it was built. Although some of this labor was hired and some family, it was all valued at $5 per hour when comparing costs. Labor expenses dropped from $3,005 to $1,625 annually.

Ownership and operating costs were determined for machinery used in manure management before and after the storage was built. Ownership costs consisted of amortization of the depreciated value, interest on the salvage value, taxes, and insurance.

Operating costs consisted of repairs, fuel, oil, and lubrication where applicable. A machine might have been used for other operations besides just manure management on the farm. This use would be considered in determining the machine's per-hour cost, but only its use in manure management is considered in the analysis.

Even though the equipment varied before and after, the total annual machinery costs were nearly the same for both systems.

For this analysis, a 20-year estimated life was used for the entire storage system except the pump, for which a 10-year life was used. The cost of replacing the pump once was included in this analysis.

The depreciated use of the storage was amortized to convert to an annual cost basis. There are no tax or insurance expenses for this storage. When the tax advantages and Agricultural Conservation Program cost sharing are included, the annual cost of the storage system computed to $4,047.

The cost to Perkins of managing manure with storage increased by $2,869 annually with the system's amortized cost included.

Economists generally analyze cost-benefit ratios to simplify the decision-making process. One of Perkins' most noteworthy benefits was the more efficient use of the cow manure. This benefit was based on 110 acres of corn and 30 acres of hayland on which he spreads manure annually.

Nitrogen (N) was valued at 32 cents per pound, phosphorus (P) at 25 cents per pound, and potassium (K) at 16 cents per pound. Perkins was able to lower his purchases by $6,000, $2,500, and $2,400 annually for N, P, and K respectively. Therefore, his total annual fertilizer savings were $10,900.

Perkins hasn't quit using commercial fertilizer—he now uses it to balance the soil's nutrients for each crop. Analyzing the manure's nutrient content and regular soil testing provide the basis for adding the commercial fertilizer.

He points out that cow manure at 20 tons per acre helps maintain soil sweetness and improve tilth. Using his new twisted shank chisel also improves early incorporation of manure after spreading and reduces soil erosion on sloping fields. Perkins says he spread 20 tons of manure per acre on 100 acres of corn ground in just 59 hours by himself.

Soil compaction is less of a problem too, Perkins says. One reason, he states, is that there are fewer trips over a field because the new liquid spreader covers more ground. Also, he can wait until the fields dry out and still have ample time to get the spreading done and plant corn.

Perkins' increased cost for the new system was $2,869; the increased benefits, $10,900. This is equal to a 3.8 to 1.0 benefit/cost ratio—or, for each dollar he spent on manure management, he got $3.80 in return. For Don Perkins the investment in a new agricultural waste management system not only had favorable environmental effects but also was an economically sound decision.

Vaughn Rasar,
district conservationist, SCS, Bangor, ME

Organic Waste: More Than Fertilizer

Composted sewage sludge or feedlot manure can reduce erosion and restore fertility to land disturbed by strip mining or overcropping, said Sharon B. Hornick, a soil scientist for USDA's Agricultural Research Service.

Hornick said that experiments show that addition of sewage sludge compost or feedlot manure to disturbed land reduces surface soil temperatures. This can help seeds germinate since the normally high afternoon temperatures of sandy soils can inhibit germination. Soil amended with added organic waste also retains more water than untreated soil, thus helping plants resist drought conditions.

To evaluate the effects of organic waste materials on crop production, Hornick established a series of test plots in an area where sand and gravel had been excavated.

Inorganic fertilizer and lime were applied to all of the control plots which were not to be treated with sewage sludge or manure. This was done to provide plants in the test plots with equal amounts of nutrients whether they received organic material or not, she said.

Sweet corn, field corn, and bush beans were grown on the test plots. Yields of

field corn and beans were higher from the plots treated with organic materials. Sweet corn yields were about equal although the weight of stalks and leaves was greater in the organically treated plots.

Treatment of soils with organic wastes can greatly reduce erosion and nutrient runoff. Severe erosion often occurs on soils that have been intensively farmed and have lost substantial amounts of organic matter. Soil organic matter is vitally important in keeping agricultural soils in a high state of tilth and productivity, said Hornick.

Composted sewage is not approved for use on all crops. Some municipal sludge contains heavy metals such as zinc, copper, cadmium, nickel, and lead. Crop plants may take these metals up thus making them unsafe for human use or animal feed.

The poor growth of vegetation occurring on mine spoils is often attributed to high acid soil and inadequate levels of nitrogen, phosphorus, potassium, and magnesium, Hornick said.

Research is needed on the best management practices involving the time, rate, frequency, method of application, and cropping sequence for these materials, noted Hornick.

Waste Disposal System Keeps Reservoir Clean

Animal waste management systems built on 20 farms northeast of Dallas, TX, mean cleaner water draining into the Lake Creek Reservoir, which is a source of drinking water for Dallas.

A typical system was built by Gary Bishop, who operates a 100-cow dairy near Miller Grove.

"I can now clean up after milking in a matter of minutes," Bishop said. "It saves me at least an hour and a half of work every day, and water that leaves this place is much cleaner."

Bishop's land drains almost directly into Lake Fork Creek, which flows into the reservoir.

He has an 800-gallon water storage tank that flushes his concrete milk shed twice daily; 230 feet of underground pipe take the water to two earthen ponds. The upper pond serves as an anaerobic lagoon where animal wastes are treated through bacterial action and settlement. Solids settle to the bottom while the treated water drains into a second pond where it is stored until it is used to irrigate nearby grassland.

Bishop said the system has worked perfectly and has been trouble-free since it was built in 1979.

Max W. Baker, Soil Conservation Service district conservationist, and Buford L. Folmar, SCS conservation technician, working through the Hopkins–Rains Soil and Water Conservation District, helped Bishop design and install the agricultural waste management system.

Bishop received cost-share assistance on the system through a special water quality project administered by USDA's Agricultural Stabilization and Conservation Service.

"We try to design these types of waste management systems so the lower pond will store a 2-month supply of waste water," Folmar said. "That way, the producer has the needed management flexibility to operate his system successfully."

Folmar said of the 20 systems installed, 18 have been on dairy farms and 2 have been on swine feedlots.

Bishop owns 86 acres of land and rents 150 acres. Most of the land is in improved pasture where he grows all his hay and forage.

Dale D. Allen,
public affairs specialist, SCS, Temple, TX

On Gary Bishop's dairy farm near Miller Grove, TX, wastes are piped to the upper pond, which serves as an anaerobic lagoon. After solids settle to the bottom, treated water drains into the lower pond where it is stored until it is used to irrigate nearby pastures.

Meetings

January	7–11	American Farm Bureau Federation, Honolulu, HI
	14–17	North American Gamebird Association, Las Vegas, NV
February	3–7	National Association of Conservation Districts, Honolulu, HI
	10–13	Land Improvement Contractors of America, Corpus Christi, TX
	11–15	Society for Range Management, Salt Lake City, UT
	21–22	Conference on Erosion Control Practices and Research, San Francisco, CA
March	10–15	American Society of Photogrammetry, Washington, DC
	15–20	North American Wildlife and Natural Resources Conference, Washington, DC
	17–19	American Pulpwood Association, Washington, DC
	17–20	National Wildlife Federation, Washington, DC
April	21–24	Association of American Geographers, Detroit, MI
	28–May 1	League of Women Voters of the United States, Washington, DC
	28–May 2	National Council of State Garden Clubs, Nashville, TN
May	5–10	Association of Interpretive Naturalists, Seattle, WA
	13–16	Garden Club of America, San Francisco, CA
	19–22	National Conference on Nonpoint Source Pollution, Kansas City, MO
	29–31	Southern Forestry Conference, New Orleans, LA
June	2–6	General Federation of Women's Clubs, Houston, TX
	22–26	American Water Works Association, Washington, DC
	23–26	American Society of Agricultural Engineers, East Lansing, MI
	23–27	American Seed Trade Association, Nashville, TN
	23–27	Forest Products Research Society, Orlando, FL
	24–27	National Environmental Health Association, Las Vegas, NV

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